

The At-risk Foot: the Role of the Primary Care Team in Achieving St Vincent Targets for Reducing Amputation

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Foot ulceration and ultimately amputation are major complications associated with diabetes mellitus, the occurrence of which can be substantially reduced by appropriate care. This article provides a brief overview of the problem and a simple scheme for use in primary care diabetes clinics to contribute to the reduction in this particular form of diabetes-related morbidity and mortality. © 1998 John Wiley & Sons, Ltd.

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Introduction

The at-risk foot in a person with diabetes is one that is at risk of infection, ulceration, and subsequent amputation. The St Vincent Declaration target for footcare is to reduce the number of amputations from diabetic gangrene by 50 % in 5 years.¹ In the UK, a joint task force with representation from the British Diabetic Association (BDA) and the Department of Health was established to develop strategies to achieve the targets of the declaration. The report of the Diabetic Foot and Amputation subgroup of the Task Force² offers several strategies to achieve this 50 % reduction in amputations in the UK. These strategies include screening for the at-risk foot in primary care, special review and education for those at risk, and the prompt referral to a specialist diabetes footcare team should ulceration and/or infection occur.

This review looks at the evidence base for these strategies and focuses on issues surrounding their implementation.

Pathophysiology of the At-risk Foot

Neuropathy and ischaemia are the two major tissue complications that are responsible for the development of the foot at risk. Peripheral neuropathy often leads to sensory deficit with the loss of protective pain sensation and the development of autonomic dysfunction. Ischaemia results from atherosclerosis which usually affects the distal vessels of the lower limb in a symmetrical fashion.

Neuropathy may be the dominant feature resulting in a foot which is numb but which has good foot pulses, or alternatively there may be features of both neuropathy

and ischaemia giving a pulseless numb foot. The purely ischaemic foot is rare. About 50 % of feet presenting in dedicated diabetic foot clinics are neuropathic and about 50 % are neuro-ischaemic.^{3,4} However, there are other common risk factors which may contribute to the development of ulceration including the presence of callus, limited joint mobility, bony deformity, and poor glucose control.⁵

Primary Prevention of the At-risk Foot

Good Control of Blood Glucose

The DCCT trial⁶ has clearly shown that in Type 1 diabetes intensive control (defined as a HBA_{1c} result of 7 % or below) reduces the risks of developing neuropathy. Current thinking suggests that a correlation between good blood glucose control and a reduced risk of neuropathy may exist in Type 2 diabetes, therefore blood glucose levels should be optimized where practical.

Good Control of Hypertension

Hypertension is associated with an increased risk of amputation and the person with diabetes and hypertension has a fivefold risk of developing peripheral vascular disease.⁷ Good control of hypertension is therefore important.

Stopping Smoking

In people with diabetes smoking is a risk factor in peripheral vascular disease, so stopping smoking is important.⁸

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Education in Foot Care

An 85 % reduction in below-knee amputations has been demonstrated in Geneva due to a specific footcare teaching programme.⁹ The benefits of footcare education for both patients and healthcare workers has been demonstrated in a randomized controlled trial in the USA. After 1 year patients in the intervention group had a lower prevalence of serious foot problems and took better care of their feet. Health carers in the intervention group were more likely to examine the feet and record their findings.¹⁰

Secondary Prevention

The presence of ischaemia and/or neuropathy does not mean that ulceration and amputation are inevitable. Secondary prevention in the at-risk foot can be effective, particularly if early recognition is achieved through regular clinical assessment at a diabetes annual review.¹¹

Recognition of the At-risk Foot in Primary Care

This can be done through taking a brief history of previous foot problems and performing a simple foot examination after removing the shoes and socks. It does not require any expensive equipment and takes only a few minutes. Such an examination should be done at each diabetes annual review in general practice.

History of Previous Amputation or Ulceration

A history of previous amputation or ulceration puts the foot at risk. Following amputation, the remaining limb is particularly at risk. This may be due to increased plantar pressure loading and the fact that most pathophysiological processes are bilateral.¹²

Foot Inspection to Detect Deformity and Callus

The foot deformities of claw and hammer toes, prominent metatarsal heads, Charcot arthropathy, overriding toes, hallux valgus, and hallux rigidus all may contribute to a high-risk foot. The motor component of peripheral neuropathy gives rise to small muscle wasting, resulting in an imbalance of flexor and extensor muscles which contributes to these deformities.¹³ Hard skin in the form of callus may arise at points of abnormally high repetitive pressure in the foot. The presence of callus is a powerful predictor of ulceration.¹⁴

Detection of Ischaemia

The posterior tibial and dorsalis pedis pulses should be palpated. Absence of these pulses indicates ischaemia

and puts the foot in the at-risk category.² The advanced ischaemic foot characteristically feels cold and may be pale and cyanosed. Further assessment of the degree of ischaemia may need to be carried out by the district footcare team.

Detection of Neuropathy

The role of impaired vibratory perception in the pathogenesis of foot ulceration has been well documented.¹⁵ Objective measurement of this sensory parameter with the biothesiometer has been used to identify those at risk of developing ulceration.¹⁶ However this instrument is not widely available in the community and the assessment of vibration sensation using a 128 tuning fork is much less reliable. Testing for the absence of protective pain sensation using the 5.07 nylon monofilament is now seen by many as being the easiest and most discriminating method of detecting people with diabetes in danger of neuropathic ulceration.^{2,17} The filament is applied to at least five sites on the foot (but *not* over callus) until it buckles, which occurs at 10 g of linear pressure, when the patient is asked to detect its presence. If it is not detected, then protective pain sensation is lost.¹⁷

Testing with the 5.07 monofilament has been shown to have excellent within and between observer reproducibility and good specificity for the detection of peripheral neuropathy.¹⁸ In a 352 patient randomized control trial monofilament testing was the most important prospective predictor of severe foot lesions.¹⁹ Another study has suggested that monofilament testing might be superior to the biothesiometer in screening for patients at risk.²⁰

The monofilament is now becoming more widely available in the UK and costs between £10 and £15. Using this instrument as part of a simple foot assessment in primary care at the annual diabetes review will enable feet at risk to be identified and will allow extra education and follow-up to be given to those who are most at risk of developing ulceration.

Summary: For Detection of the At-risk Foot

- *History* of previous ulceration or amputation.
- *Inspection* for deformity and callus.
- *Examination*
 - for *ischaemia* by checking foot pulses
 - for *loss of protective pain sensation* using the 5.07 monofilament.

Insensitivity to the monofilament can be used to develop a simple ladder of increasing risk, with the normal foot as 0, the insensate foot as 1, the insensate and deformed foot as 2, and a history of previous ulceration as 3. Such a scheme has been tested in primary care in the USA where 358 people with diabetes were followed for 32

months. Forty-one developed ulceration and incidence rates correlated positively with increasing risk category. All 14 amputations occurred in risk groups 2 and 3.²¹

Appropriate Follow-up After Foot Examination

If Foot is Normal

1. Give general footcare education and advice. The European Association for the study of Diabetes (EASD) footcare education leaflet may be considered appropriate,²² as may leaflets produced by the BDA.
2. Repeat foot check at annual review in 1 year.

If Foot is At-risk

1. Give more detailed instruction and education. The EASD leaflet for foot at risk may be considered appropriate.²³
2. Refer for podiatry treatment if required.
3. Review 3-monthly in a specialist foot at-risk clinic.

If Ulceration or Infection is Present

1. Urgent referral to specialist diabetes footcare team. Most authorities would suggest that they ought to be seen by the team the same day or next available day.²⁴

District Diabetes Footcare Teams

A number of centres around the world have published uncontrolled studies showing reductions in amputation rates around the St Vincent target of 50 % through the progression of screening, education and the development of these multidisciplinary teams. For example in the King's College hospital clinic a team of diabetes specialist chiropodist, shoe fitter, nurse, surgeon, and physician working together were able to demonstrate a reduction in amputations of 40 % and healing rates of 86 % for neuropathic and 72 % for ischaemic ulcers.³ Relapse rates in those who wore special shoes was 26 % compared with 83 % who wore their own shoes. Prompt referral of people who develop ulcers and infection to such teams is another step towards the achievement of the St Vincent target. At present a number of districts in the UK do not have such teams. Most however will have a chiropodist with special interest in diabetes. They may be the most appropriate person to call for help when ulceration presents in primary care, in the absence of a defined team.

Investment in Screening, Education, and Footcare Teams

A recent editorial has costed a major amputation at £12 686 (including limb fitting) and a minor one at

£3172. At the predicted rate of 4800 amputations annually (half major and half minor) that is a cost of £38.06 million. A 50 % reduction represents an annual saving of £19.03 million for the UK.²⁵

There are costs for the development of education, screening and footcare teams, but the paper demonstrates that these are small compared with the potential savings. It states that the cost-effectiveness of diabetic footcare has been established. Pump priming for additional resources is required, but those costs will be rapidly recouped. If the investment is not made, much greater sums of money will be spent on increasing numbers of amputations. There is a need to press for such investment so that the St Vincent target can be met.²⁶ The investment will have to support the need for clinical audit, continuous professional development, comprehensive diabetes registers, and evidence-based practice. Achieving it will be of obvious benefit to people with diabetes and will be cost-effective.

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